DMD Spectroscopy

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(with DMD slides from Massimo Robberto)

WFIRST SDT #2, March, 2011

Outline

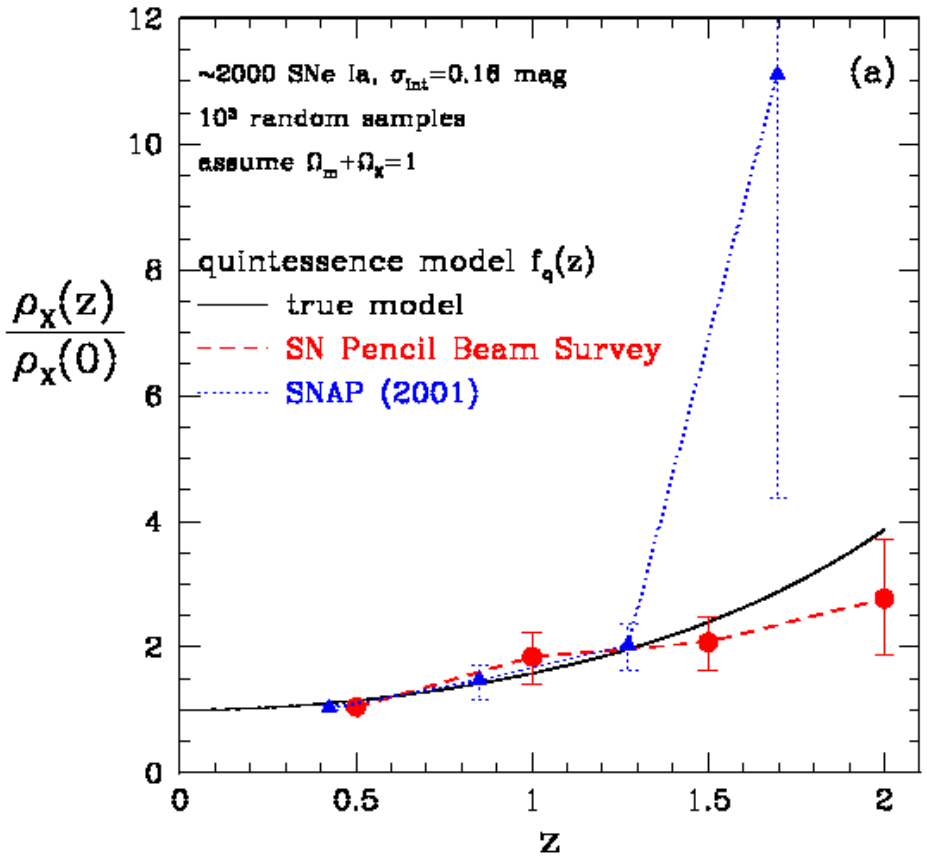
- **Scientific Advantages of Multi-slit Spectroscopy**
- **A status report on DMDs**

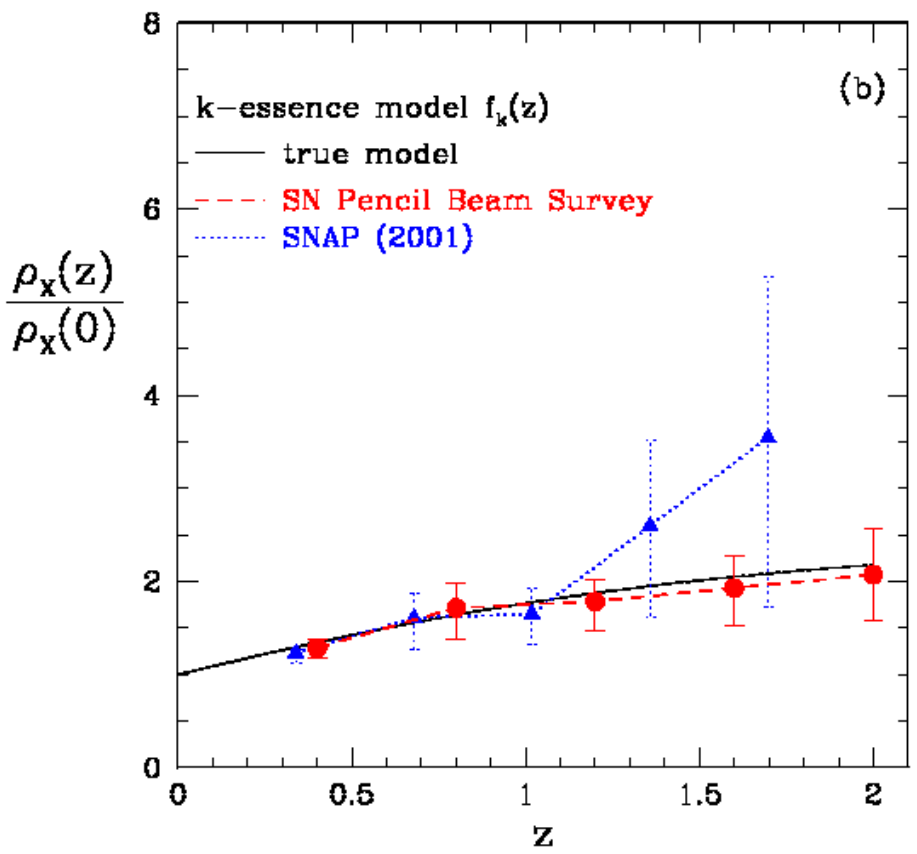
Four Scientific Advantages of Multi-object Slit Spectroscopy

1) An order of magnitude improvement in efficiency of high quality supernova spectroscopy (better spectra to higher redshifts) – *minimizes SNe systematic errors.*
2) A magnitude-limited spectroscopic wide survey of galaxies – *minimizes BAO systematic errors.*
3) A larger set of spectroscopic redshifts for photometric redshift calibration – *minimizes WL systematic errors.*
4) Greatly boosted legacy science

Getting the most distant SNe Ia:

critical for measuring the evolution in dark energy density:

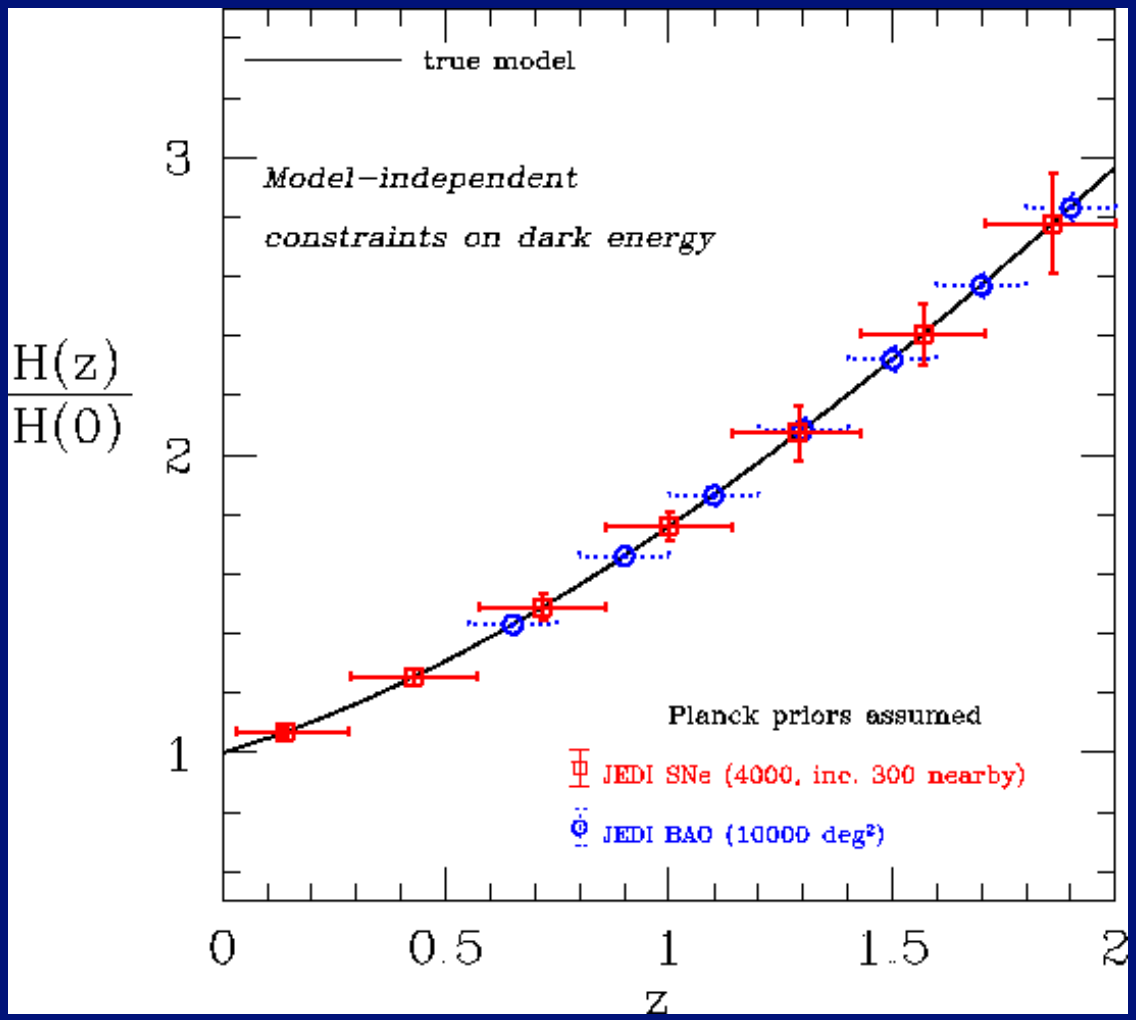




Comparison of a deep survey to z~2 with a wider shallow survey to z~1.2

Wang & Lovelave (2001)

Supernovae give an independent measurement of H(z)



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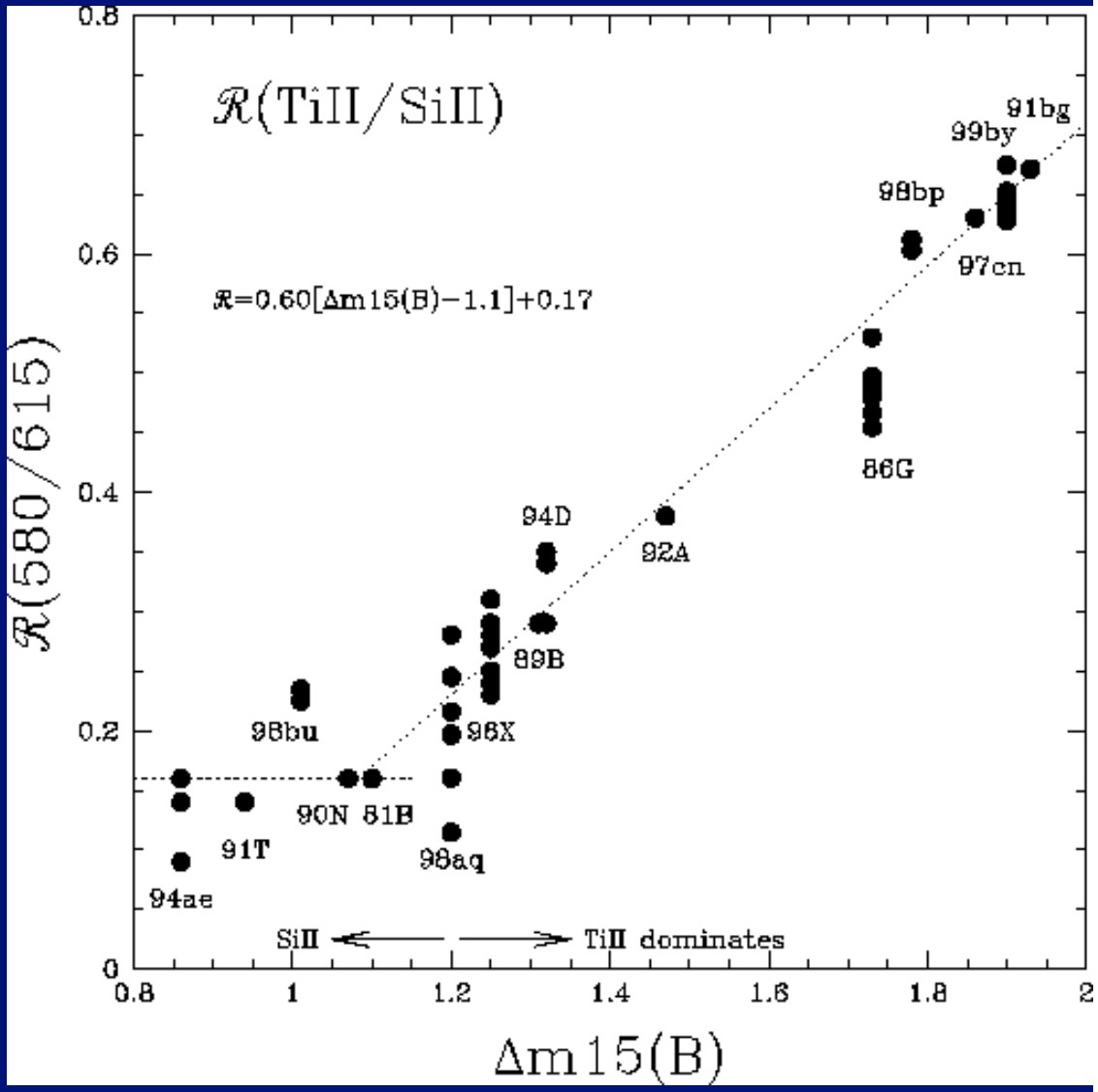
Spectroscopic indicators of SN Ia luminosity

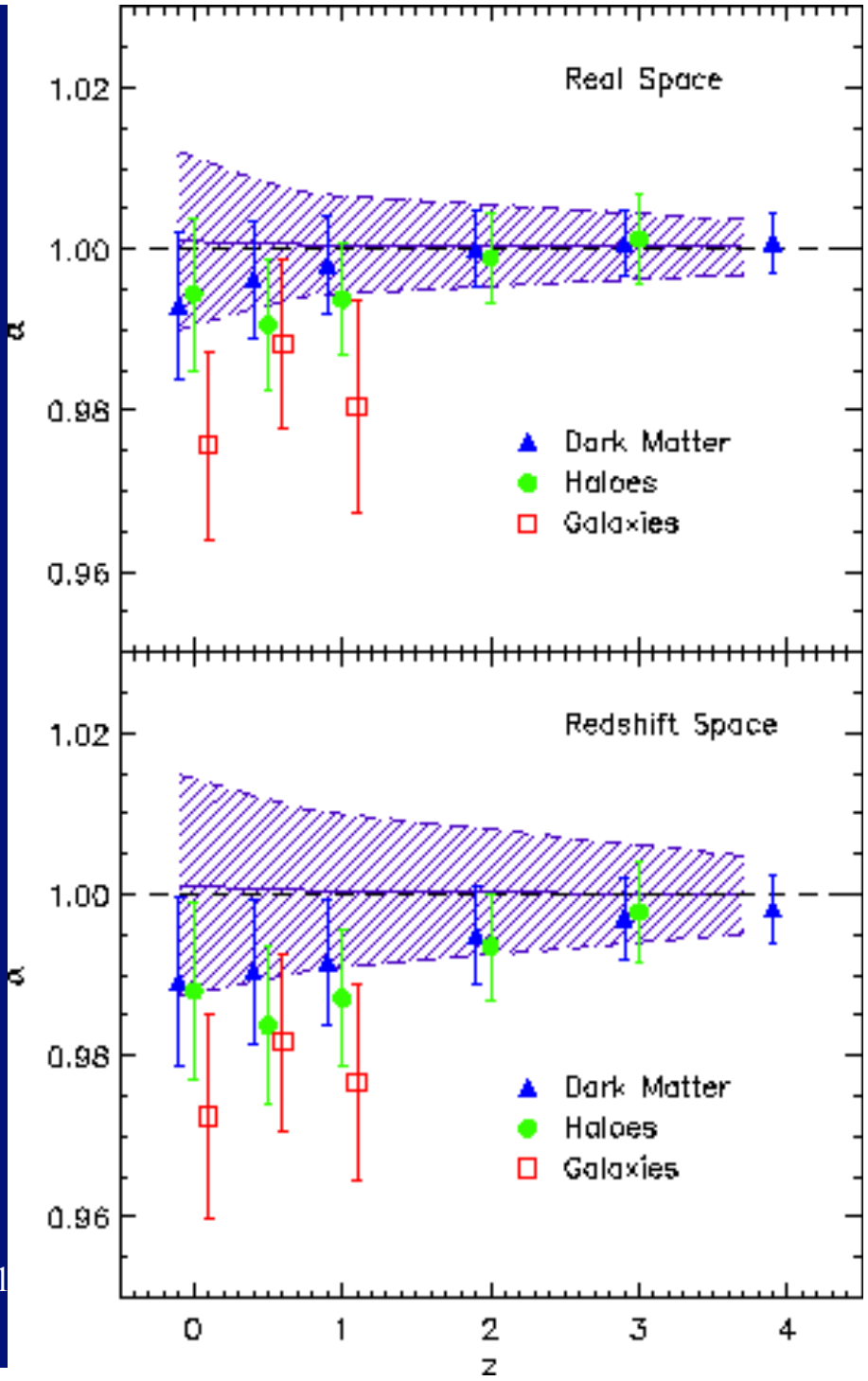
- The 580/615 nm line depth ratio

Garnavich et al. (2004)

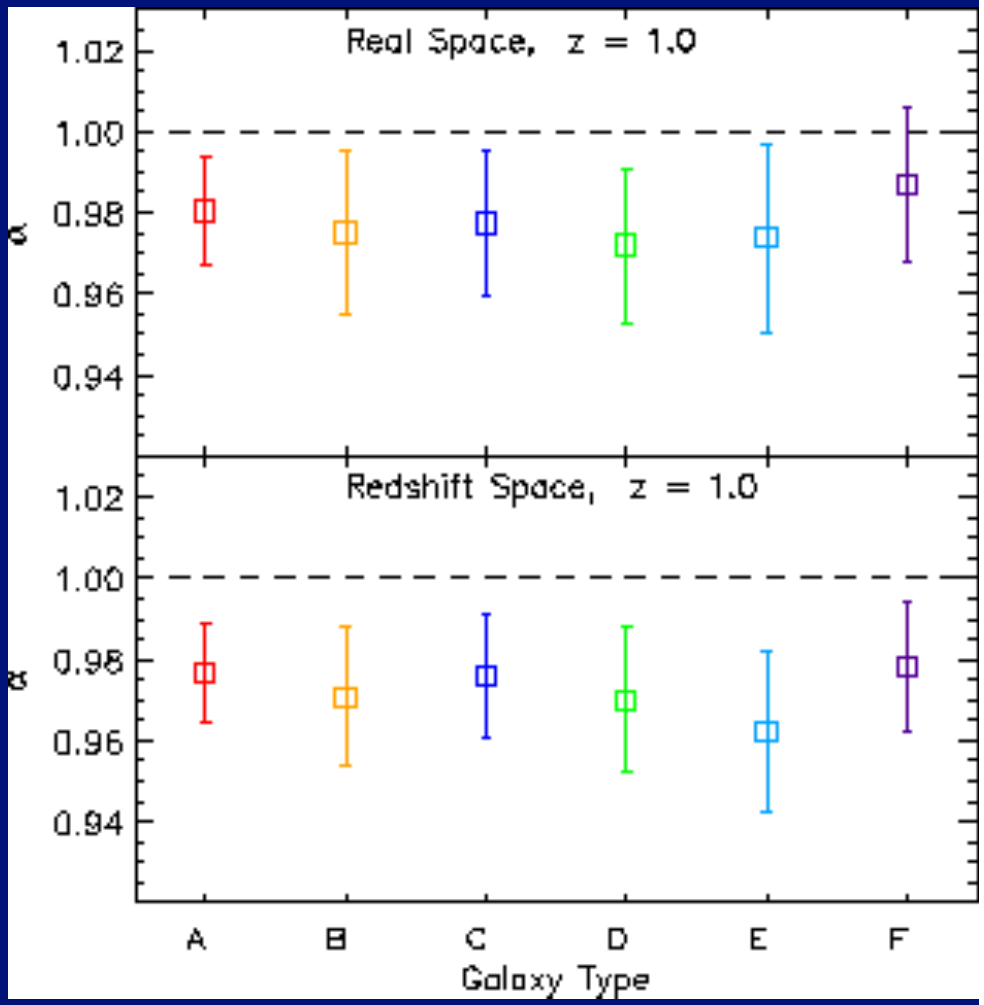


- We use galaxies as BAO tracers.
- α=1: unbiased BAO scale measurement
- Results from a high resolution simulation
  - 2.41(Gpc/h)^3 comoving
  - Semi-analytic model of galaxy formation
  - Galaxies from a magnitude-limited sample, space density $5.4\times10^{-4}(h/\mathrm{Mpc})^3$

Angulo et al. (2008)

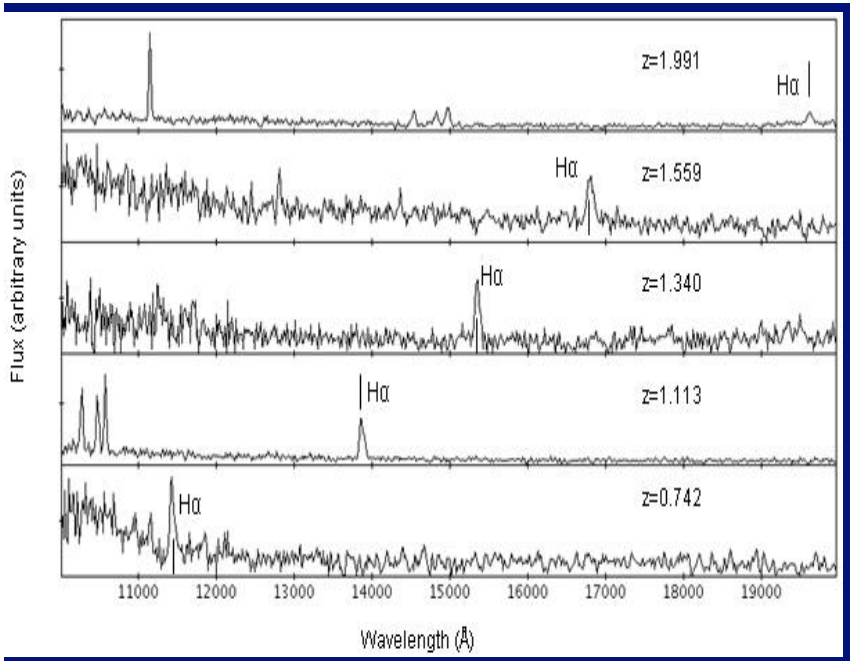


- **A: magnitude-limited sample with $n_A=5.4\times10^{-4}(h/\mathrm{Mpc})^3$**
- B: magnitude-limited sample with $n=n_A/2$
- C: reddest 50% of galaxies from sample A
- **D: 50% of sample A with the strongest emission lines, selected using the equivalent width of OII[3727]**
- E: bluest 50% of galaxies from sample A
- **F: 50% of sample A with weakest emission lines.**



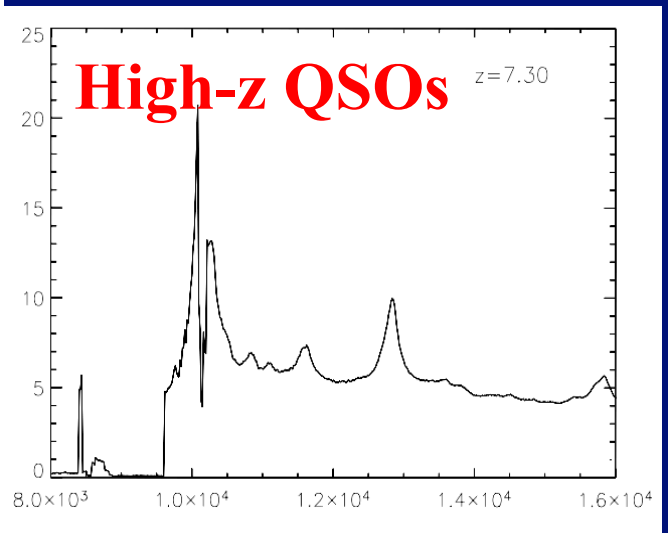
BAO scale bias:
2% for A, 3% for D

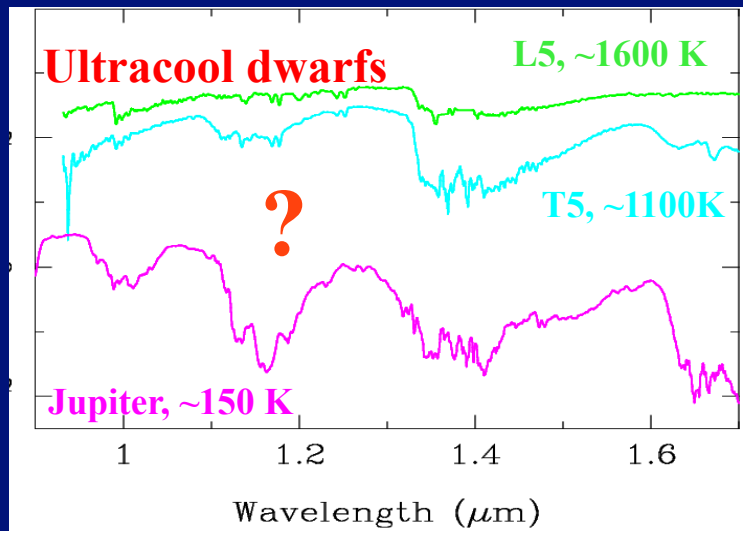
Angulo et al. (2008)



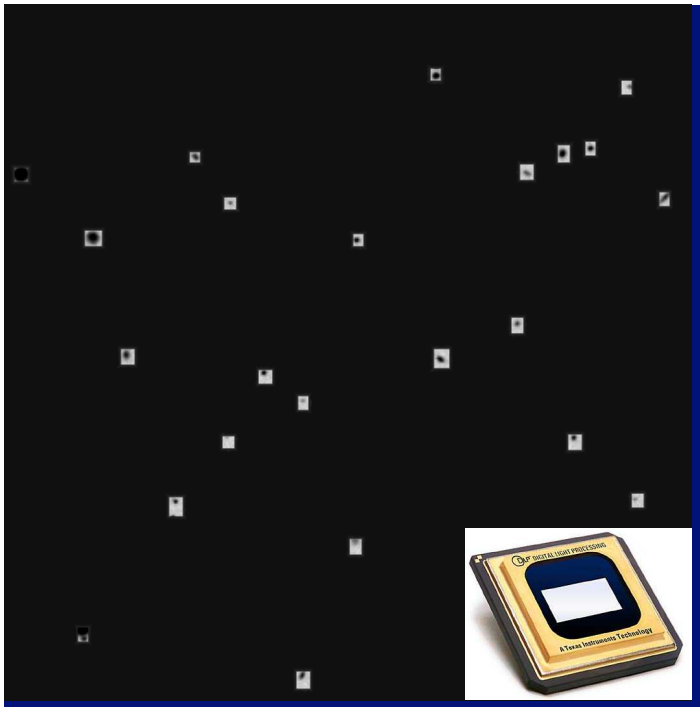
Legacy Science / Slitless

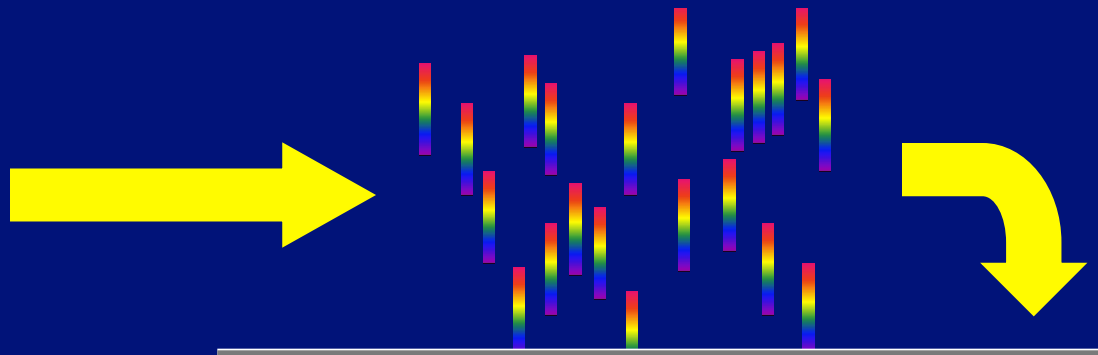
- 70 million galaxies & AGNs: >1000x more redshifts than now at z ~1 and >70x than SDSS !
- Statistical studies with unprecedented statistics
- Clusters of galaxies (mostly at z < 1)
- Clustering and halo statistics
- The largest unbiased survey for high-z QSOs
- Most luminous objects at z > 7 (*Deep Survey*)
- Our Galaxy (ultracool dwarfs, IMF…), **+GAIA**
- **Synergies: VIS/NIP, multi-λ surveys, JWST**

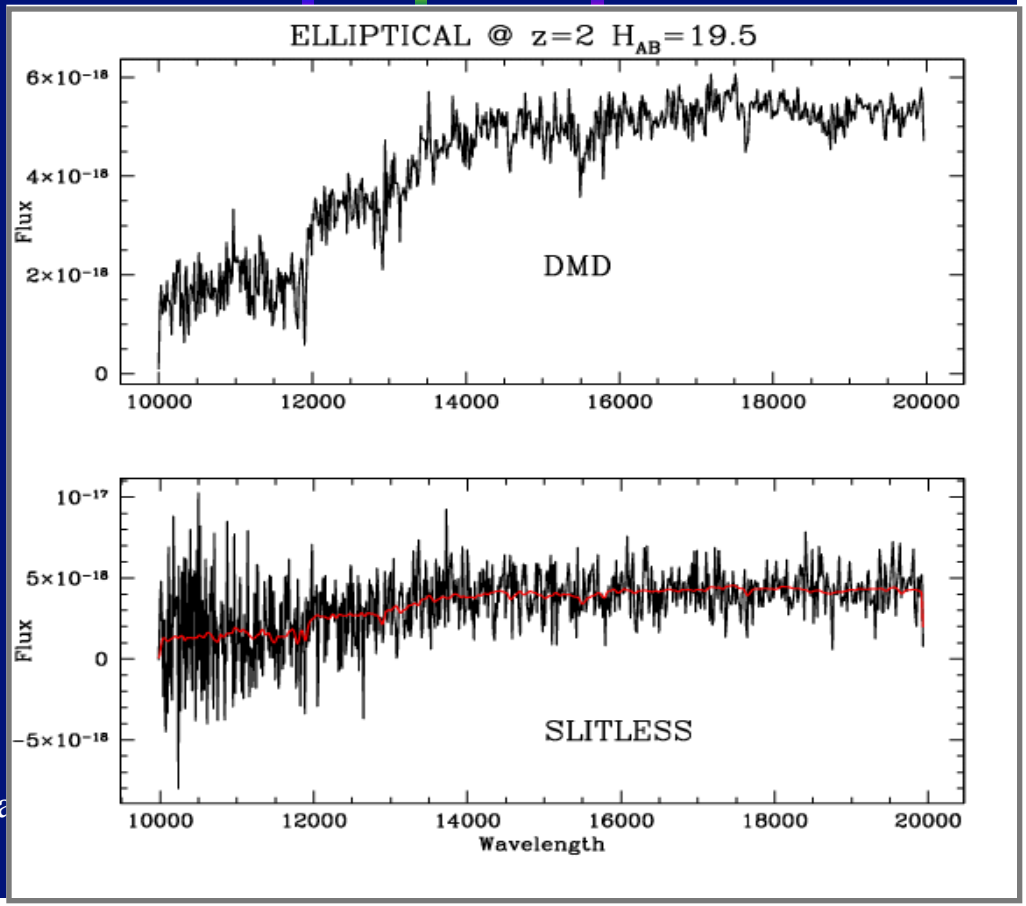




DMD "slit" spectroscopy (option)







- All galaxy types
- H<22 (AB)
- N(gal) ≥ 2×10^8
- 0<z<2.5
- V_{eff} = 50 h^{-3} Gpc^3
- FoM = 2-3x
- + E/S0 galaxies
- + Clusters at z>1
- Boost of legacy value

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